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Bibliometric Analysis of International Academic Studies on Unconscious Bias

Bilinçsiz Önyargı Üzerine Yapılmış Uluslararası Akademik Çalışmaların Bibliyometrik Analizi

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ABSTRACT

Objective: This study aims to examine the international literature on "unconscious bias" using bibliometric methods.

Method: The study seeks to uncover the main research topics, significant collaboration networks, and the most influential studies on unconscious bias. The bibliometric analysis was conducted on 474 articles published between 1996 and 2023, obtained from the Web of Science database. The data were subjected to performance analysis using the "bibliometrix" package in the R programming language, and scientific mapping techniques were applied. Performance analyses evaluated metrics such as the number of articles, the most productive journals, researchers, universities, and countries. Scientific mapping focused on the co-occurrence network of conceptual topics, the networks of co-cited articles and authors, and the collaboration networks among authors and countries producing articles.

Results: The analysis results indicate a marked growth in the volume of articles on unconscious bias from 1996 to 2023, with a particularly sharp increase beginning in 2012. The "Journal of Experimental Social Psychology" emerged as the leading journal publishing these articles. The most productive researchers included John Francis Dovidio, Payne B. Keith, and Nilanjana Dasgupta. The United States was found to be the leading country with the most publications, having 334 articles on unconscious bias. The analyses also revealed the interdisciplinary nature of the collaboration networks and the cited studies in this research area.

Conclusion: Research on unconscious bias has evidently attracted growing interest over the years, embracing an interdisciplinary approach. The studies on unconscious bias are increasingly recognized for their social and academic importance and are approached from a broad perspective.

Keywords: Unconscious bias, implicit bias, bias, discrimination, bibliometric analysis

ÖZ

Amaç: Bu çalışma, "bilinçsiz önyargı" konusundaki uluslararası literatürü bibliyometrik yöntemlerle incelemeyi amaçlamaktadır.

Yöntem: Bu bağlamda, bilinçsiz önyargıya dair temel araştırma konuları, önemli iş birliği ağları ve en etkili çalışmaları ortaya koymak hedeflenmiştir. Bibliyometrik analiz, Web of Science veri tabanından elde edilen ve 1996-2023 yılları arasında yayımlan 474 makale üzerinden gerçekleştirilmiştir. Veriler, R programlama dilinde "bibliometrix" paket programı kullanılarak performans analizine tabi tutulmuş ve bilimsel haritalama teknikleri uygulanmıştır. Performans analizlerinde, makale sayısı, en üretken dergiler, araştımacılar, üniversiteler ve ülkeler gibi metrikler değerlendirilmiştir. Bilimsel haritalamada ise kavramsal konuların birlikte oluşum ağı, ortak atıf yapılan makaleler ve yazarlar arasındaki ilişki ağları, makale üreten yazarlar ve ülkeler arasındaki iş birliği ağlarına odaklanılmıştır.

Bulgular: Analiz sonuçları, 1996-2023 yılları arasında bilinçsiz önyargı konusundaki makale sayısında önemli bir artış olduğunu göstermektedir. Özellikle 2012 yılından itibaren makale sayısında belirgin bir artış gözlemlenmiştir. En fazla makale yayımlayan dergi "Journal of Experimental Social Psychology" olurken, en üretken araştırmacılar arasında John Francis Dovidio, Payne B. Keith ve Nilanjana Dasgupta'nın yer aldığı görülmüştür. Bilinçsiz önyargılar ile ilgili yayınlarda Amerika Birleşik Devletleri'nin, 334 makale ile en fazla yayına sahip ülke olduğu anlaşılmıştır. Analizler ayrıca, araştırma konusundaki iş birliği ağlarının ve atıf yapılan çalışmaların disiplinler arası doğasını da ortaya koymuştur.

Sonuç: Bilinçsiz önyargı araştırmalarının, yıllar içinde giderek artan bir ilgi gördüğü ve bu konuyla ilgili disiplinler arası bir yaklaşımın benimsendiği anlaşılmıştır. Bilinçsiz önyargı üzerine yapılan çalışmaların toplumsal ve akademik öneminin giderek arttığı ve bu konunun geniş bir yelpazede ele alındığı görülmüştür.

Anahtar sözcükler: Bilinçsiz önyargı, örtülü önyargı, önyargı, ayrımcılık, bibliyometrik analiz

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Introduction

Unconscious biases are automatic thought patterns that individuals adopt without realizing it and that shape their behavior; they often operate beyond our conscious awareness and unconsciously guide our behavior and decisions (Oberai and Anand 2018, Kagetsu and Gunderman 2018, Glas and Faloye 2021). These biases emerge from social, cultural, and personal experiences and profoundly affect individuals' decision-making, perception, and interaction processes (Lopez 2018, Kagetsu and Gunderman 2018, Lai 2020). Unconscious bias is a phenomenon that people are often unaware of, and is a concept that has negative consequences (Oberai and Anand 2018). This situation can negatively affect interpersonal and social relationships (Lopez 2018). Lopez (2018) stated that unconscious bias is often called implicit bias. This term was first used in 1995 by Greenwald and Banaji (1995) in their article on implicit social cognition. These two psychologists argue that social behavior is significantly influenced by unconscious associations and judgments. Implicit bias is defined as unconsciously held attitudes and stereotypes that influence an individual's behavior, understanding, and decision-making processes. Despite widespread belief in one's lack of prejudices and stereotypes, it is not feasible for individuals to completely avoid these biases. Although individuals may perceive themselves as possessing egalitarian values and attitudes under typical interaction processes and conditions, they may occasionally exhibit prejudiced behavior. The concept of unconscious bias aids in elucidating these situations, specifically addressing why and how individuals may engage in prejudiced conduct.

Unconscious biases can lead to discrimination, marginalization, and inequality of opportunities (Marcelin et al. 2019, Emberton 2021, Malgorzata and Noa 2024). For example, an employer may unknowingly favor a majority candidate over an ethnic minority candidate, limiting access to jobs, education, and other resources for minority groups. These biases can also lead to marginalization and social exclusion. Individuals with certain characteristics such as ethnic groups and sexual or gender identities may feel invisible or excluded by society. This can negatively affect psychological and social well-being (Dasgupta 2004, Dovidio and Fiske 2012). Our experiences, cultural conditioning, and social norms contribute to the formation of these biases, and can be deeply embedded in our unconscious (Caballero et al. 2023, Marino et al. 2021). Unconscious biases can appear in essential areas such as health, education, workplace, law, or our relationships and interactions in social life. Research has revealed how unconscious biases can affect decision-making processes in critical areas, such as workplaces, educational institutions, health services, and the justice system, and how they can undermine the concepts of equal opportunity and social justice (Hsueh et al. 2015, Castillo-Page et al. 2018, Walker and Wang 2018, Arif and Schlotfeldt 2021). For example, unconscious bias can perpetuate health disparities in healthcare and negatively impact patient-clinician interactions, hiring, promotion, and interprofessional interactions (Marcelin et al. 2019, Gopal et al. 2021). In other words, unconscious bias can affect patient care in medical settings. For example, biases based on race, ethnicity, and obesity can negatively affect the clinical interactions and treatment decisions (Dehon et al. 2017, Schoenberg et al. 2019, Caballero et al. 2023). Decision-making can also be influenced by unconscious biases. For example, even if a judge is not conscious of it, a defendant's sentencing may be influenced by factors such as race, ethnicity, or social status, leading to justice system inequality. The unconscious biases that come into play in the workplace are automatic and unconscious preferences that influence decisions about individuals, such as age, weight, physical attractiveness, skin color, gender, and disability (Kagetsu and Gunderman 2018). For example, they can negatively impact hiring and promotion decisions, performance evaluations, and daily organizational interactions, thereby reducing diversity and productivity (Oberai and Anand 2018). Similarly, such biases can affect educators' expectations and interactions with students in educational settings, potentially negatively impacting the academic performance or achievement of minority students either directly or indirectly (Heffernan 2021, Frisby 2021, Woolway 2021).

Finally, unconscious bias can also be a source of social tension and conflict. Prejudices and misunderstandings between groups can create obstacles to social harmony and peace (Fiske 2002, Dovidio et al. 2003, Jost et al. 2012, Kagetsu and Gunderman 2018, Sun et al. 2022, Malgorzata and Noa 2024). These biases can penetrate the deepest layers of the social structure, shaping the lives of individuals, and eventually societies. Therefore, being aware of these biases and overcoming them is crucial for efforts to create a more just and equitable society.

Studies on unconscious biases include approaches from various academic disciplines such as psychology, sociology, law, and health sciences. These studies focus on understanding the effects of biases and developing strategies to reduce the problems that arise from them (Banks and Ford 2008, Dovidio and Fiske 2012). In recent years, there have been intense discussions on the social effects, formation, maintenance, and reduction of unconscious bias (Webster et al. 2022). These discussions are carried out to address the problems created by biases at the individual and institutional levels and to build a more just and equitable society.

In line with the above evaluations of unconscious bias, the primary purpose of this study is to examine the international literature on unconscious bias using bibliometric methods, and to reveal the general trends, essential research topics, most influential studies, and critical collaboration networks in the field. This study examined international academic studies on unconscious bias using a bibliometric method. This study aims to reveal this field's general trends and its conceptual, social, and intellectual structures. In this context, the number of articles produced in the field of research, which journals are the most productive, who are prominent researchers in the field, and which universities and countries are prominent, were determined. In addition, the most influential publications in this field, whose topics have been distinguished over the years, the co-occurrence network of conceptual topics, and the relationship networks between the most frequently cited studies were also investigated. Finally, we examined how collaboration networks are formed between researchers and countries. These analyses help us to understand which main themes and methodologies are widely used for unconscious bias, who the most influential studies and authors are, and how research networks are formed. In addition, this study points to knowledge gaps and new research opportunities that can guide future studies.

This study makes several contributions to the literature on the unconscious bias. First, it provides a systematic review of unconscious bias through a bibliometric analysis of international studies. Thus, this study provides a comprehensive framework for understanding the current state of the field and research trends. This study identifies which themes and theoretical approaches are prominent in unconscious bias, thus serving as a roadmap for future research. In addition, by revealing the most influential studies, researchers/authors, and collaboration networks in the field, researchers can point to critical reference points in relevant literature, future work, and collaboration opportunities. Finally, by identifying the knowledge gaps in the literature, this study emphasizes new research opportunities to fill these gaps. In these aspects, the study contributes to academic discussions on unconscious bias from theoretical and methodological perspectives.

Method

Bibliometric analysis is a method that allows the quantitative analysis of bibliographic material to examine the structure and development of knowledge in a particular research area. This method is a crucial tool in literature reviews because it provides objective data independent of the subjective judgments of the researchers.

Bibliometric analysis will help track the changes and developments in studies on unconscious bias over time and to understand the periods in which research in this field has increased or decreased. In this way, it can be revealed which topics have received more attention, which methodological approaches have been used, and which are the key concepts in this field. Identifying the main topics that studies on unconscious bias focus on will help to understand the scope and depth of research in this field. In this way, the basic and specific topics that have been studied more and the areas that are still open to discovery can be determined. Bibliometric analysis highlights the importance of the findings obtained from these studies by identifying the most cited and influential studies in the literature. This information provides important reference points for new research and guides researchers on the studies they can start. Identifying the most influential studies also guides researchers regarding the sources to which they should refer. Thus, researchers can strengthen the scientific basis of their studies by having easier access to essential findings and theories in the literature. The analysis of general trends in the field provides researchers with insights into future research topics and trends. This information can help researchers to plan their studies for future development and develop more innovative approaches.

Bibliometric analysis is a quantitative examination of bibliographic materials to examine the structure and development of knowledge in a specific research area (Maretti et al. 2019). Bibliometric analysis, in comparison to traditional literature reviews, enables objective examination of the research area, independent of the subjective judgments of the researcher in data collection and analysis. The most important strength of this method is its ability to quantitatively examine and synthesize numerous documents and articles (Zupic and Cater 2015). Therefore, researchers use the bibliometric analysis method to evaluate the performance of scientific articles and journals, define collaboration models, and reveal the direction in which researchers, academic journals, countries, and organizations contribute to science, which are considered components of research, handle science, and the intellectual structure of a scientific field of study in the literature (Donthu et al. 2021). Bibliometric analysis examines articles produced within a certain period and the scientific performance of researchers to discover how a particular field of study emerged and developed (Rejeb et al. 2022). According to Crane (1972 cited in Bayer 1982), bibliometric analysis provides the opportunity to evaluate the research examined in a field at five basic points. This enable the determination of i. the impact of the characteristics of scientific articles on the relevant field, ii. the contribution of researchers to the relevant scientific field, iii. the

network of influence of scientific articles on the scientific community, iv. the prestige of journals contributing to the scientific field, and v. the productivity of specific countries, academic institutions, or departments.

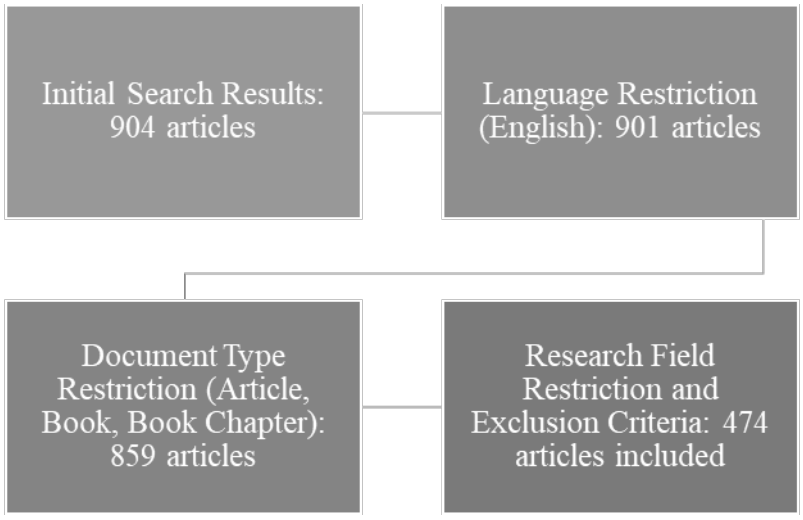
Determination of Data Search Terms and Database Selection

Data search terms related to the research area were first created to analyze international studies on "unconscious bias" using the bibliometric method. Possible words/word groups related to unconscious bias were determined in this context. The data search terms are listed in Table 1.

Table 1. Data search terms/keywords	
Unconscious bias	Implicit bias
Explicit bias	Inner bias
Discrimination	Prejudice

In the bibliometric method, data is obtained from various databases. Web of Science (WoS), Scopus, PubMed, Embase, SpringerLink, Dimensions, Microsoft Academic, and Google Scholar are examples of such databases. However, not all these databases provide suitable data for bibliometric analyses (Moral-Munoz et al. 2020, Gursoy 2022). The WoS database provides comprehensive and appropriate data on research fields, and is frequently used by researchers in bibliometric studies (Moral-Munoz et al. 2020). Therefore, the WoS was selected as the database for this study. The WoS field categories included in this study are listed in table below:

Table 2. WoS field categories				
Law	Psychology social	Psychology multidisciplinary	Philosophy	Nursing
Sociology	Psychology applied	Social sciences interdisciplinary	Ethics	Political science
Social issues	Ethics studies	Multidisciplinary sciences	Humanities multidisciplinary	Psychology



Scheme 1. Acquisition of data and data selection criteria

Data acquisition, data selection and exclusion criteria

Research data were obtained from the WoS database on December 27, 2023. Subject headings were selected for the search in the WoS database. Articles containing the search terms in the title, abstract, and keywords" sections of the relevant studies were examined. No data selection criteria were applied in the first stage and 904 articles were obtained. After reviewing the articles, we decided to determine the data selection criteria. First, only English was selected as the article language, and 901 articles were obtained. Second, a restriction was imposed on document type. Only articles, books, and book chapters were included in the research data, and 859 articles were obtained. Finally, a restriction was made to the research field category within the scope of the data selection criterion, and exclusion criteria were used. In this context, natural sciences and mathematics (astronomy and astrophysics, physics, chemistry, mathematics, geology, and environmental sciences), engineering and

technology (engineering, computer science, telecommunications, materials science, automation, and control systems), medical and health sciences (surgery and cardiology), agriculture and veterinary (agriculture, food science and technology, veterinary sciences, plant sciences, and animal sciences), and economics and business (finance and operations research) fields were excluded from the scope of the research. In line with these exclusion criteria, 474 articles were included in the study and analyses were conducted on these data. This process is illustrated in the flowchart in Scheme 1.

This study did not involve direct experimental intervention or data collection from human participants. The scope of the research was based only on existing literature, secondary data sets, theoretical analyses, and non-human materials. Therefore, ethics committee approval was not required for studies that did not involve human participants.

Data Analysis

Data analysis was performed using the R programming language. The "bibliometrix" package program, developed by Aria and Cuccurullo (2017) and used in the R programming language, was used for bibliometric analysis. Data analysis techniques in bibliometric studies were performed in two ways: i. Performance analysis, and ii. Scientific mapping. Performance analysis aims to reveal the contributions of authors, universities, journals, countries, and articles that produce articles in a discipline to the relevant field. Scientific mapping explains the components that contribute to a discipline, and the relationships or interactions between them (Donthu et al. 2021).

Within the scope of this study, performance analyses and scientific mapping were included based on the research questions. With performance analyses, the number of articles produced in the research field; the most productive researchers, journals, universities, and countries; the most influential publications based on citations; and the most frequently occurring keywords in studies and trending topics were analyzed. Scientific mapping is the visual expression of networks related to relationships in a research field (Zupic and Cater 2015). In this study, scientific mapping included the co-occurrence network of conceptual topics in the research field, relationship networks between co-cited articles and authors, and collaboration networks between authors who produced articles and countries. The co-occurrence network of conceptual topics and the conceptual structure of the field, the co-citation networks created according to articles and authors, the intellectual structure of the field, and the collaboration network of authors and countries explain the social structure of the research field (Cobo et al. 2011, Rodríguez-Soler et al. 2020).

In all analyses performed within the scope of scientific mapping, the normalization "association" and clustering algorithm "Walktrap" technique were selected, and the number of nodes in the networks was determined to be 50. Additionally, at least two or more relationships/collaborations were included in the created network visuals, and isolated nodes were removed from the analysis. The network nodes were evaluated according to the research components included in the analysis. For example, in a mapping/network visual representation of researcher collaborations, each node represents a researcher, the size of the nodes represents the most influential researcher in the network or cluster, and the lines between the nodes represent the connections between researchers (Aria et al. 2020). Information about which node is the most important in network analysis and which node is at the center is provided by centrality measures (Demirgil 2018). High betweenness centrality (btwc), which is a centrality measure, indicates the importance of the relevant node within the network (Ukşul 2016). Therefore, betweenness centrality was included in the evaluation of network analyses carried out within the scope of scientific mapping in this study.

Results

The data in Table 3 shows that 474 articles were produced in the 27 years from 1996 to 2023. The article production rate for the subject examined in this period was 14.19%. This means that approximately 17.56 articles were produced on average each year. The annual article production rate indicates the annual rate of increase in article production. This rate indicates that the number of articles published annually increased by 14.19 %. For example, if 100 articles are produced in one year, this number is expected to increase by 14.19% in the following year, meaning that approximately 114 articles are produced. These data show that there has been a significant increase in the production of articles over time and that the research is supported by comprehensive literature. Furthermore, although the number of single-authored articles was low, collaborative work was more common. This information reflects the dynamics of the research field and the culture of collaborative work. Each article had an average of 31.96 citations. This shows the frequency with which articles are generally cited by other sources. In total, 25,946 references were included in the reviewed publications. This represents the total

number of references to sources in the publications. A total of 145 publications were produced by one author, and 329 were produced by more than one author during the relevant period.

Table 3. Basic information on the data	
Time period	1996-2023
Number of articles	474
Annual article production rate	14.19%
Average number of citations per article	31.96
References	25.946
Number of articles with a single author	145
Number of multi-authored articles	329

When looking at the data in Table 4, the first point that stands out is that academic publication production between 1996 and 2002 was relatively low. It is seen that a total of 2 articles were produced in 6 years. This shows that this issue was largely ignored during the aforementioned period. This is not surprising because, as emphasized in the introduction, unconscious bias was first used as a term by Greenwald and Banaji in their article published in 1995. There was a relative, albeit slight, increase between 2003 and 2007. The subject became an area of interest in academic studies between 2008 and 2015, as the number of publications stabilized. The average annual number of publications in this seven-year period was 17.4. Between 2016 and 2020, the number of articles published annually increased from 26 to 51. There was a significant increase in the number of publications between 2019 and 2020. The number of publications continues to be high between 2021 and 2023. In particular, a peak was reached with 60 publications by 2022. It can be seen that 36 articles were published by the end of 2023, the year this screening was conducted.

Table 4. Number of articles by year					
Years	**Number of articles**	**Years**	**Number of articles**	**Years**	**Number of articles**
1996	1	2006	6	2016	26
1997	0	2007	9	2017	40
1998	0	2008	12	2018	30
1999	1	2009	12	2019	46
2000	0	2010	12	2020	51
2001	0	2011	13	2021	38
2002	0	2012	24	2022	60
2003	2	2013	16	2023	36
2004	3	2014	14	Toplam	474
2005	3	2015	19		

Although research on unconscious biases was represented by a limited number of studies/articles in the mid-1990s and the early 2000s, there has been a significant increase since the early 2010s. This increase indicates that unconscious biases are receiving increasing attention in social sciences and other disciplines. The rapid growth after 2012 may be related to increased awareness of unconscious biases in academic circles and society and the need for further research on this topic. This increase can also be seen as a reflection of diversity and inclusion initiatives in the education and workplace. The sudden increase in the number of articles after 2016 may be linked to global social and political changes. In particular, social and political movements and social justice initiatives may have contributed to the increased research in this area. The significant increase in the number of articles published in 2020 coincides with the Covid pandemic. This may indicate that people think more about social behaviors and biases during this period and that academic interest is focused on these topics. In addition, the increase in remote work, education, and digital interactions may have opened new research areas on unconscious bias. Overall, the increase in research on unconscious bias reflects the increasing social and academic importance of this topic and the rapid expansion of knowledge in this area.

The data in Table 5 show that the journal that published the most articles on unconscious bias was the “Journal of Experimental Social Psychology” which published 19 articles in total. The “Personality and Social Psychology Bulletin” is in second place with 14 articles, while the “California Law Review” is third with 10 articles. It is understood that the number of articles in most journals in the table varies between 4 and 10.

"The Journal of Experimental Social Psychology" has a quartile value [quartile values categorize academic journals based on their impact factors or other metrics. Journals are divided into four quartiles from top to bottom- q1, q2, q3, and q4. Q1 represents the top quartile, Q4 represents the bottom quartile] of Q1, and extremely high h-index and g-index values. This indicates that the journal has published high-impact publications in this field and plays a leading role in research on the unconscious bias. Journals such as "Personality and Social Psychology Bulletin" and "Journal of Personality and Social Psychology", which have a quartile value of Q1, also have high h-index and g-index values and make essential contributions to this field. [h-index measures how many of a researcher's at least h articles have been cited at least h times each. It assesses the number and impact of a researcher's publications. The g-index measures how many of a researcher's most-cited articles have received at least g^2 of citations. It measures the impact of publications and the density of their citation distribution (Egghe 2006)].

Table 5. Most relevant journals/Journals publishing the most articles

	Journals	**Number of articles**	**h-index**	**g-index**	**Total number of citations**
1	Journal of Experimental Social Psychology	19	15	19	1638
2	Personality and Social Psychology Bulletin	14	8	14	228
3	California Law Review	10	6	10	864
4	Frontiers in Psychology	10	5	8	79
5	Journal of Personality and Social Psychology	10	7	10	657
6	Psychological Science	10	7	10	321
7	Philosophical Psychology	7	3	3	17
8	Plos One	7	6	7	86
9	Social Psychological and Personality Science	7	5	7	271
10	European Journal of Social Psychology	6	5	6	164
11	Group Processes & Intergroup Relations	6	5	6	188
12	Hastings Law Journal	6	4	6	99
13	Journal of Homosexuality	6	3	6	76
14	Social Cognition	6	4	6	68
15	Journal of Social Issues	5	4	5	67
16	Ucla Law Review	5	4	5	323
17	Frontiers in Human Neuroscience	4	4	4	241
18	Harvard Law Review	4	2	4	249
19	Indiana Law Journal	4	3	4	56
20	Journal of Applied Social Psychology	4	2	4	18

The most cited journal is the "Journal of Experimental Social Psychology", with 1638 citations. The "California Law Review" is second with 864 citations, and the "Journal of Personality and Social Psychology" is third with 657 citations.

Law journals such as the "Hastings Law Journal" and "Harvard Law Review" also make essential publications in this field. This shows that unconscious bias is an important research topic not only in psychology, but also in law. Law journals are generally notable for their high citation numbers, which means that research in these fields has reached a broad audience and is influential. Journals such as "Frontiers in Psychology" and "Plos One" have published a significant number of articles on the subject, even though they have relatively low h-index and g-index values. These journals show that research on unconscious bias covers a wide range and is examined by different disciplines.

Data from academic journals that publish with unconscious bias indicate that research in this area has received broad interdisciplinary attention and has a significant academic impact. The high citation counts and index values of articles in these journals demonstrate the importance of the topic in academic circles and the quality of research.

Table 6 shows that the researcher with the most publications is John Francis Dovidio, who has published 14 articles in total. Dovidio is Carl Iver Hovland Professor Emeritus of Psychology and Public Health at Yale

University and the former director of the Intergroup Relations Laboratory. He is well known for his research on the concept of racism and the reduction of intergroup prejudice.

Payne, B. Keith, Professor of Psychology and Neuroscience at the University of North Carolina at Chapel Hill, is in second place with 9 articles, while Nilanjana Dasgupta (Dasgupta, a professor of social psychology, is a social psychologist who studies implicit bias and harmful stereotypes. She is the director of the Institute of Diversity Sciences and an associate professor at the University of Massachusetts, Amherst) and Jeffrey Sherman (Professor of Social Psychology at the University of California, Davis). He works on social cognition, stereotypes, and implicit bias) is in third place with 8 articles. The number of articles published by other researchers varied between 4 and 7.

Table 6. Researchers with the most articles

	Researchers	Number of articles	h-index	g-index	Total number of citations
1	DOVIDIO JF	14	10	14	520
2	PAYNE BK	9	6	9	434
3	DASGUPTA N	8	7	8	563
4	SHERMAN JW	8	6	8	222
5	CALANCHINI J	7	4	6	46
6	KANG J	7	6	7	592
7	DEVINE PG	6	6	5	954
8	GAWRONSKI B	6	4	6	293
9	KLAUER KC	6	6	6	214
10	MOSKOWITZ GB	6	5	6	83
11	ELLEMERS N	5	4	5	476
12	HOLROYD J	5	3	5	53
13	ONYEADOR IN	5	4	5	207
14	PENNER LA	5	5	5	337
15	AMODIO DM	4	4	4	177
16	BROWNSTEIN M	4	4	4	108
17	FITZGERALD C	4	3	4	1170
18	GAERTNER SL	4	4	4	338
19	GLASER J	4	3	4	281
20	HAGIWARA N	4	4	4	109

Dovidio has the highest h-index values of 10 and g-index values of 14. These indicators reveal that the researcher has published highly influential articles in this field. Researchers, such as Dasgupta and Payne, also have high h-index and g-index values. The researcher with the most citations among the top 10 publications is Devine, who received 954 citations. Kang is in second place with 592 citations, while Dasgupta is in third place with 563 citations.

The data show that Dovidio stands out as an academic who has published the most articles in this field, and has high h-index and g-index values. This indicates that the researcher is pioneering in unconscious bias research. The term unconscious bias was first used in 1995 by Greenwald and Banaji (1995) in their article on implicit social cognition. These two psychologists argue that social behavior is significantly influenced by unconscious associations and judgments (Suveren 2022: 415). In particular, the pioneering work of Greenwald and his colleagues (as seen in Table 8) and others has been influential. Dovidio's work with his colleagues, specifically on unconscious bias and the Implicit Association Test, began in the late 1990s. In particular, an article published by his colleagues in 2002 was quite influential (Dovidio et al. 2002). At this point, the time factor should be considered when analyzing the effects of all authors. The fact that Devine has the highest value in the total citation count shows that this researcher's work has a wide area of impact and has made significant contributions to the field. Although researchers ranked between 5 and 10 have fewer articles, they have also contributed to the field, and their work is noteworthy.

The total number of citations of researchers indicates their interest in their work and its impact. The high citation numbers of researchers such as Devine suggest that their work is considered a fundamental reference

in their field and that these works reach a broad audience. The high number of citations and index values of researchers reveal the importance and quality of the subject in academic circles. Researchers who publish in this field generally come from various disciplines such as social psychology and law. This situation again confirms that unconscious bias is examined in a multifaceted and comprehensive manner and addressed by different disciplines, as mentioned in the other table analyses above.

At this point, we believe that a statement about citation counts is necessary. Citation counts reflect the impact and level of interest of the articles in each journal. However, citation counts alone cannot be said to determine the quality of an article. The content, methodology, impact, and contributions of this article should also be considered. There is a difference in the ease of access between WoS, a relatively limited academic database, and Google Scholar, which is open to everyone globally. WoS is a database that includes indexed publications from scientific journals. Accordingly, WoS sources are generally referred to and widely accepted scientific articles. Google Scholar has a broader content and can include books, theses, conference proceedings, and sometimes non-scientific sources. WoS uses a more rigorous approach to the indexing process and update frequency. A specific evaluation process is passed for the publications indexing, and the frequency of updates is regular. Google Scholar has a more automated indexing process that can be updated quickly. The two platforms have different search and filtering options. WoS offers more advanced search options and allows for more specific queries regarding scientific publications. Google Scholar, on the other hand, allows for more comprehensive searches, but sometimes the results can be less precise. WoS is a commercial platform that is usually accessible by university libraries and research institutions through subscription. Google Scholar is a free service that anyone can access. Deciding between different platforms requires a careful consideration of the advantages and disadvantages of each option.

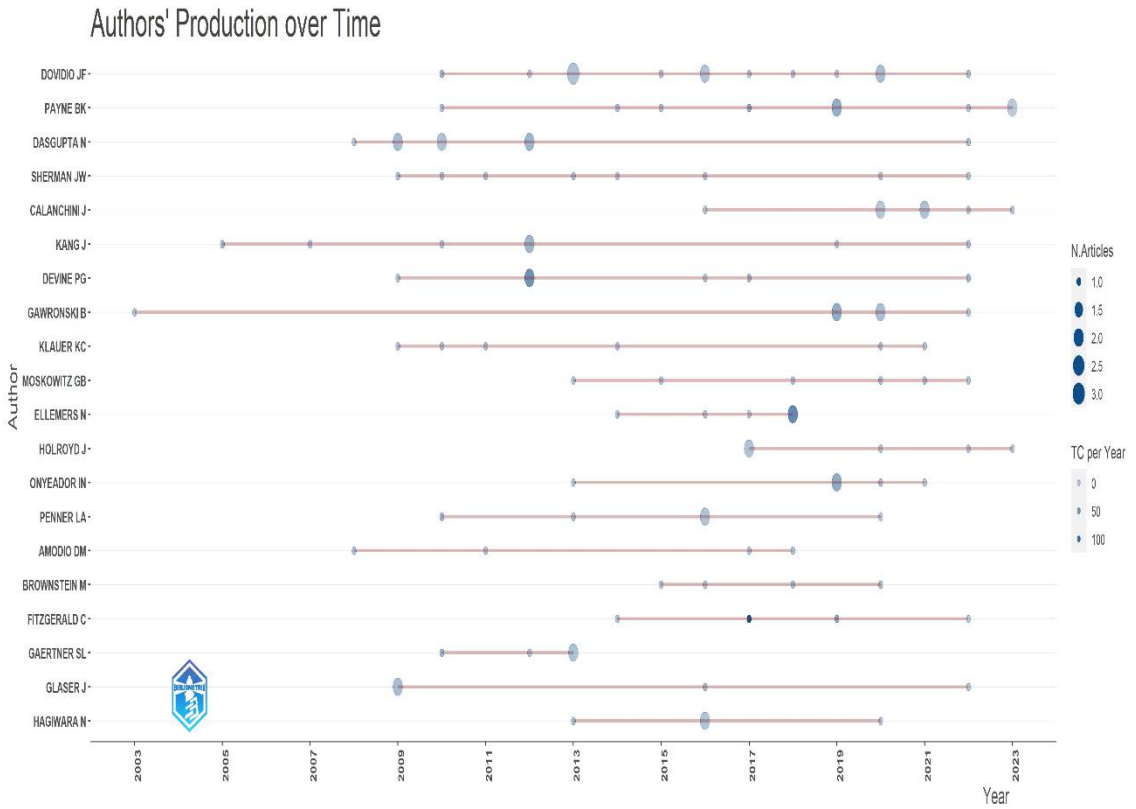


Figure 1. Number of articles by researchers over the years

It can be said that the analysis of the performance of researchers over the years on the subject of unconscious bias also provides remarkable information. In this respect, when we look at the data in Figure 1, it is observed that some researchers produced more articles in specific years during the 2003-2023 period. There is a general tendency for the productivity of researchers to increase as time progresses. There has been a significant increase in the number of studies on unconscious bias, especially after 2010, and some researchers stand out in this period. For example, Dovidio has consistently produced publications and their impact (i.e., the number of citations) is quite high. Researchers Payne and Dasgupta have also been producing articles regularly and have

produced high-impact studies. Devine also stood out by publishing a large number of articles, especially in specific years, and his publications are generally highly cited.

The size of the dots in the image indicates the number of articles the researchers published that year, and the shades of color indicate the total number of citations for those articles. The more extensive and darker dots indicate more articles and higher citation counts. Researchers such as Kang and Sherman also published many articles in specific years and had a significant impact. Researchers such as Calanchini, Gawronski, and Ellemers may have had relatively less of an impact based on their number of articles. Figure 1 shows that some researchers' productivity fluctuated in specific years. These fluctuations may be related to factors such as academic careers, research funding, or changing trends in the field. For example, some researchers may publish few articles in a given year, whereas others may have published fewer or no articles.

In summary, research on the unconscious bias has received increasing attention since 2003. A significant increase in the number of publications on this subject was observed, especially after 2010. This situation shows the increasing importance of unconscious bias in the social sciences and other disciplines. Leading researchers such as Dovidio have made significant contributions to the literature in this field. They have regularly produced many articles over the years that have been cited by a broad academic audience. Other researchers have contributed significantly to this field and published influential studies in various years. In conclusion, the distribution and impact of publications on unconscious bias over the years show that academic interest and research activities in this field are increasing, and that this topic is of broad interdisciplinary interest.

Table 7. Most productive institutions/universities

	Universities	**Number of articles**
1	University of California, USA	74
2	Yale University, USA	36
3	University of Massachusetts, USA	28
4	University of North Carolina, USA	24
5	University of Washington, USA	24
6	Harvard University, USA	23
7	University of Colorado, USA	21
8	University of Michigan, USA	23
9	California State University, USA	20
10	University of Wisconsin, USA	19
11	University of Minnesota, USA	18
12	New York University, USA	17
13	State University of New York, USA	17
14	University of Texas, USA	16
15	University System of Georgia, USA	14
16	State University of Florida, USA	14
17	University of Hawaii, USA	14
18	City University of New York, USA	12
19	Stanford University, USA	10
20	Northwestern University, USA	9

Table 7 provides essential information about the "Most productive universities/institutions" on unconscious bias. The most striking data in the table are that all the top 20 universities producing publications in the field are US universities. There are several reasons for this. For example, US universities generally have substantial financial resources and extensive research funds. Accordingly, these universities have a solid research infrastructure, such as advanced laboratories, libraries, and data analysis facilities. This makes it possible to conduct in-depth and comprehensive research. These resources allow researchers to work on complex and comprehensive issues such as unconscious bias. It is also known that many universities in the USA place importance on diversity and inclusiveness policies. These policies support research on issues, such as unconscious bias. In addition, the USA has a multicultural society, and this diversity increases the importance of unconscious bias. Accordingly, the issues of unconscious bias and discrimination have a vast place in society and public opinion. Sensitivity to such social problems also finds a response in academic circles and has become

a priority among research topics. Therefore, these data reveal several factors that explain why US universities stand out in the issue of unconscious bias. Research funds, social sensitivity, and global academic hegemony are essential factors that increase the effectiveness of US universities in this area.

According to the table 7, the total number of articles is 433. The first five most productive universities produced 186 articles, which constituted a large portion of the total. The ratio of articles published by the first five universities to the total number of articles was 42.96%. Looking at the data more closely, we find the three most productive universities. The University of California has the highest number of articles on this subject, publishing 74. Yale University is second with 36 articles, while the University of Massachusetts is third with 28 articles. The Universities of North Carolina and Washington are fourth, with 24 articles each. Prestigious universities such as Harvard and the University of Michigan have also published many articles. Public universities, such as California State and the State University of New York, have significantly contributed to unconscious bias research. Stanford and Northwestern Universities are prestigious private universities in the USA that have contributed to this subject.

The fact that the University of California is the most productive in this field provides information about its research capacity and breadth. The fact that the University of California has more than one campus and a relatively higher number of researchers working there may be effective for this high productivity. This university's importance to the subject of unconscious bias and the research opportunities it provides contributes to high research output. The high productivity of universities such as Yale, Harvard, Michigan, and Stanford can be attributed to their research budgets, faculty quality, and student support. Research on unconscious bias in these universities has an essential place in academic literature and is a reference for other researchers. Large-scale public universities, such as New York State and California State universities, have large student and research populations and support research in these areas. The contributions of state or public universities to unconscious bias highlight the importance of this topic in social and educational terms.

Table 8. Countries, number of articles and collaborations of corresponding authors/researchers

	Countries	**Number of articles**	**Article rate (%)**	**Number of collaborations**	**Collaboration rate (%)**
1	United States of America (USA)	334	0.71	25	0.08
2	United Kingdom	26	0.06	4	0.16
3	Canada	14	0.03	4	0.29
4	Australia	12	0.03	6	0.50
5	Germany	10	0.02	3	0.30
6	Switzerland	9	0.02	2	0.22
7	Netherlands	8	0.02	1	0.13
8	Swedish	7	0.02	1	0.14
9	Ireland	4	0.01	3	0.75
10	Denmark	3	0.01	0	0.00
11	France	3	0.01	2	0.67
12	Israel	3	0.01	0	0.00
13	Italy	3	0.01	0	0.00
14	New Zealand	3	0.01	1	0.33
15	Norway	3	0.01	0	0.00
16	Spain	3	0.01	0	0.00
17	Belgium	2	0.00	1	0.50
18	China	2	0.00	1	0.50
19	Austria	1	0.00	0	0.00
20	Brazil	1	0.00	0	0.00

The universities on the list are located in different geographical regions, which shows that unconscious bias is a broad area of interest and has been examined from various perspectives. Universities' diverse academic programs and interdisciplinary approaches have increased the diversity and depth of research in this area. As a result, the most productive universities on unconscious bias indicate that research in this area is conducted over a wide range and is of high quality. It can be said that the research outputs of these universities contribute to an

increase in knowledge and the development of social awareness on the subject of unconscious bias.Table 8 and Figure 2 provide information on the countries, number of articles, and collaboration status of academic publishing on unconscious bias. When looking at the data, it was seen that the USA published the most articles, with 334 articles. This corresponds to 71% of the total number of articles. The United Kingdom published the most articles, followed by the USA with 26 articles (6%), Canada with 14 articles (3%), Australia with 12 articles (3%), and Germany with 10 articles (2%). Other countries generally produced fewer than 10 articles, each accounting for less than 1% of the total articles.

Australia and Ireland had high collaboration rates in terms of the number of articles. Australia's collaboration rate is 50% and that of Ireland is 75%. France had a collaboration rate of 67%. This shows that domestic and international collaboration was high. Countries such as Canada and Germany also had high collaboration rates (29% and 30%, respectively). The USA has a collaboration rate of 8%, with 25 collaborations for 334 articles, which is a relatively low rate. Countries such as Denmark, Israel, Italy, Norway, Spain, Austria, and Brazil have low or no collaboration rates, in addition to a low number of articles. However, countries such as China and Belgium have high collaboration rates, despite producing fewer articles (50%).

It is clear from the data that the United States plays a dominant role in research on unconscious bias. Many articles, significant academic resources, and research facilities have reinforced the country's leadership in this area. However, the low collaboration rate suggests that research is mainly conducted within the country, and that international collaborations are relatively rare.

Countries, such as Australia, Ireland, and France, have high collaboration rates. This may indicate that these countries can contribute to increasing the quality and diversity of research, because high collaboration rates allow different perspectives and expertise to come together. International collaboration is essential, especially in the sharing of scientific knowledge and methodologies. European countries, such as the United Kingdom, Germany, Switzerland, the Netherlands, and Sweden also contribute significantly to unconscious bias research. Their high collaboration rates indicated a strong breadth of space within the European scientific research and collaboration network. Countries such as China and Belgium have the potential to conduct more research and increase international collaboration because of their high collaboration rates, whereas countries such as Brazil and Austria can increase their contributions in this area through more collaboration and research.

The increase in research on unconscious bias relations and participation of more countries in this field will increase the sustainability of the subject in the global arena and the potential for developing solutions. Developing working cells will be essential in supporting such research, especially in developing ones. In summary, the distribution and collaboration of people publishing on unconscious biases among countries shows the diversity of research options in this field and the increase in international collaboration. Although the USA is prominent, other countries have essential contributions and collaborative memberships.

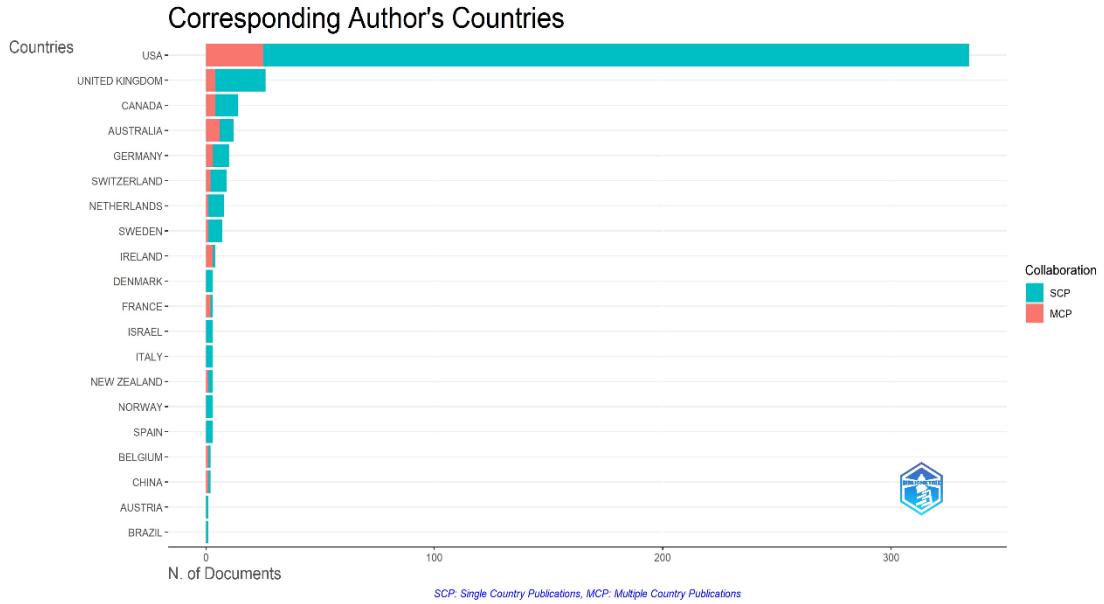


Figure 2. Countries and collaborations of corresponding authors/researchers

Table 9. Most cited articles

	Articles	WoS citation count	Google Scholar citation count
1	Implicit bias in healthcare professionals: A systematic review. FitzGerald, C. & Hurst, S., 2017, BMC Medical Ethics, 18 (19), 1-18.	981	1849
2	Seeing disorder: Neighborhood stigma and the social construction of "broken windows". Sampson, R.J. & Raudenbush, S.W., 2004, Social Psychology Quarterly, 67(4), 319-342.	970	2005
3	Long-term reduction in implicit race bias: A prejudice habit-breaking intervention. Devine, P.G., Forscher, P.S., Austin, A.J. & Cox, W.T., 2012, Journal of Experimental Social Psychology, 48(6), 1267-1278.	607	1552
4	Implicit bias: Scientific foundations. Greenwald, A.G. & Krieger, L.H., 2006, California Law Review, 94(4), 945-967.	472	1793
5	Predicting ethnic and racial discrimination: A meta-analysis of IAT criterion studies. Oswald, F.L., Mitchell, G., Blanton, H., Jaccard, J. & Tetlock, P.E., 2013, Journal of Personality and Social Psychology, 105(2), 171.	438	1144
6	Gender stereotypes. Ellemers, N., 2018, Annual Review of Psychology, 69, 275-298.	403	1164
7	Does unconscious racial bias affect trial judges. Rachlinski, J. J., Johnson, S. L., Wistrich, A. J., & Guthrie, C., 2008, Notre Dame L. Rev., 84, 1195.	299	1030
8	Demonstrations of implicit anti-fat bias: The impact of providing causal information and evoking empathy. Teachman, B.A., Gapinski, K.D., Brownell, K.D., Rawlins, M. & Jeyaram, S., 2003, Health Psychology, 22(1), 68.	278	721
9	Aversive racism and medical interactions with Black patients: A field study. Penner, L.A., Dovidio, J.F., West, T.V., Gaertner, S.L., Albrecht, T.L., Dailey, R.K. & Markova, T., 2010, Journal of Experimental Social Psychology, 46(2), 436-440.	228	462
10	Implicit bias in the courtroom. Kang, J., Bennett, M., Carbado, D., Casey, P. & Levinson, J., 2011, UCLA Law Review., 59, 1124	228	901
11	The bias of crowds: How implicit bias bridges personal and systemic prejudice. Payne, B. K., Vuletich, H. A., & Lundberg, K. B., 2017, Psychological Inquiry, 28(4), 233-248.	220	457
12	The existence of implicit bias is beyond reasonable doubt: A refutation of ideological and methodological objections and executive summary of ten studies that no manager should ignore. Jost, J. T., Rudman, L. A., Blair, I. V., Carney, D. R., Dasgupta, N., Glaser, J., & Hardin, C. D., 2009, Research in Organizational Behavior, 29, 39-69.	194	467
13	Virtual embodiment of white people in a black virtual body leads to a sustained reduction in their ımplicit racial bias. Banakou, D., Hanumanthu, P. D., & Slater, M., 2016, Frontiers in Human Neuroscience, 601.	189	421
14	Interventions designed to reduce implicit prejudices and implicit stereotypes in real world contexts: A systematic review. FitzGerald, C., Martin, A., Berner, D., & Hurst, S., 2019, BMC Psychology, 7(1), 1-12.	170	344
15	Implicit race attitudes predict trustworthiness judgments and economic trust decisions. Stanley, D. A., Sokol-Hessner, P., Banaji, M. R., & Phelps, E. A., 2011, Proceedings of the National Academy of Sciences, 108(19), 7710-7715.	167	328
16	Strong claims and weak evidence: Reassessing the predictive validity of the IAT. Blanton, H., Jaccard, J., Klick, J., Mellers, B., Mitchell, G., & Tetlock, P. E., 2009, Journal of Applied Psychology, 94(3), 567-582.	164	448
17	The law of ımplicit bias. Jolls, C., & Sunstein, C. R., 2006, California Law Review, 94, 969-996.	147	651
18	Mindfulness meditation reduces ımplicit age and race bias: The role of reduced automaticity of responding. Lueke, A., & Gibson, B., 2015, Social Psychological and Personality Science, 6(3), 284-291.	145	426
19	When organizations rule: Judicial deference to ınstitutionalized employment structures. Edelman, L. B., Krieger, L. H., Eliason, S. R., Albiston, C. R., & Mellema, V., 2011, American Journal of Sociology, 117(3), 888-954.	144	239
20	On the epistemic costs of implicit bias. Gendler, T. S., 2011, Philosophical Studies, 156(1), 33-63.	138	373

Table 9 provides essential data on the most-cited articles on unconscious bias. When the table data are examined, it is seen that the article titled "Implicit bias in healthcare professionals: A systematic review" stands out as the most cited article, with 981 citations in Web of Science (WoS) and 1849 citations in Google Scholar. The article "Seeing disorder: Neighborhood stigma and the social construction of 'broken windows'" ranks second with 970 citations in WoS and 2005 citations in Google Scholar. The article "Long-term reduction in implicit race bias: A

prejudice habit-breaking intervention" ranks third, with 607 citations in WoS and 1552 citations in Google Scholar.

Table 10. Most cited publications based on the references of the articles

	Articles	WoS citation count	Google Scholar citation count
1	Measuring individual differences in implicit cognition: The implicit association test. Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. (1998). Journal of Personality and Social Psychology, 74(6), 1464-1480.	191	16646
2	Understanding and using the implicit association test: I. An improved scoring algorithm. Greenwald, A. G., Nosek, B. A., & Banaji, M. R. (2003). Journal of Personality and Social Psychology, 85(2), 197-216.	117	6896
3	Understanding and using the Implicit Association Test: III. Meta-analysis of predictive validity. Greenwald, A. G., Poehlman, T. A., Uhlmann, E. L., & Banaji, M. R. (2009). Journal of Personality and Social Psychology, 97(1), 17-41.	96	4353
4	Implicit social cognition: Attitudes, self-esteem, and stereotypes. Greenwald, A. G., & Banaji, M. R. (1995). Psychological Review, 102(1), 4-27.	94	10108
5	Stereotypes and prejudice: Their automatic and controlled components. Devine, P.G. (1989). Journal of Personality and Social Psychology, 56, 5-18.	91	9851
6	Implicit bias: Scientific foundations. Greenwald, A. G., & Krieger, L. H. (2006). California Law Review, 94(4), 945-967.	75	1793
7	On the malleability of automatic attitudes: Combating automatic prejudice with images of admired and disliked individuals. Dasgupta, N., & Greenwald, A. G. (2001). Journal of Personality and Social Psychology, 81(5), 800-814.	65	1843
8	Implicit and explicit prejudice and interracial interaction. Dovidio, J. F., Kawakami, K., & Gaertner, S. L. (2002). Journal of Personality and Social Psychology, 82(1), 62-68.	65	2527
9	Pervasiveness and correlates of implicit attitudes and stereotypes. Nosek, B. A., Smyth, F. L., Hansen, J. J., Devos, T., Lindner, N. M., Ranganath, K. A., ... & Banaji, M. R. (2007). European Review of Social Psychology, 18(1), 36-88.	62	1480
10	Internal and external motivation to respond without prejudice. Plant, E. A., & Devine, P. G. (1998). Journal of Personality and Social Psychology, 75, 811–832.	59	2304
11	Predicting ethnic and racial discrimination: a meta-analysis of IAT criterion studies. Oswald, F. L., Mitchell, G., Blanton, H., Jaccard, J., & Tetlock, P. E. (2013). Journal of Personality and Social Psychology, 105(2), 171-192.	57	1144
12	Relations among the ımplicit association test, discriminatory behavior, and explicit measures of racial attitudes. McConnell, A. R., & Leibold, J. M. (2001). Journal of Experimental Social Psychology, 37(5), 435-442.	56	1629
13	Implicit bias among physicians and its prediction of thrombolysis decisions for black and white patients. Green, A. R., Carney, D. R., Pallin, D. J., Ngo, L. H., Raymond, K. L., Iezzoni, L. I., & Banaji, M. R. (2007). Journal of General Internal Medicine, 22, 1231-1238.	54	1707
14	Prejudice and perception: the role of automatic and controlled processes in misperceiving a weapon. Payne, B. K. (2001). Journal of Personality and Social Psychology, 81(2), 181-192.	54	1698
15	The police officer's dilemma: Using ethnicity to disambiguate potentially threatening individuals. Correll, J., Park, B., Judd, C. M., & Wittenbrink, B. (2002). Journal of Personality and Social Psychology, 83(6), 1314-1329.	53	1943
16	The malleability of automatic stereotypes and prejudice. Blair, I. V. (2002). Personality and Social Psychology Review, 6(3), 242-261.	51	1707
17	Harvesting implicit group attitudes and beliefs from a demonstration web site. Nosek, B. A., Banaji, M. R., & Greenwald, A. G. (2002). Group Dynamics: Theory, Research, and Practice, 6(1), 101-115.	51	2010
18	Variability in automatic activation as an unobtrusive measure of racial attitudes: A bona fide pipeline? Fazio, R. H., Jackson, J. R., Dunton, B. C., & Williams, C. J. (1995). Journal of Personality and Social Psychology, 69(6), 1013-1027.	50	3850
19	Reducing implicit racial preferences: II. Intervention effectiveness across time. Lai, C. K., Skinner, A. L., Cooley, E., Murrar, S., Brauer, M., Devos, T., & Nosek, B. A. (2016). Journal of Experimental Psychology: General, 145(8), 1001-1016.	50	604
20	The content of our categories: A cognitive bias approach to discrimination and equal employment opportunity. Krieger, L. H. (1995). Stanford Law Review, 1161-1248.	49	1653

Google Scholar citation counts are generally higher than those of WoS, indicating that the articles are widely cited and read. The 2005 Google Scholar citation count for the article "Seeing disorder: Neighborhood stigma and the social construction of 'broken windows'" illustrates this.

When looking at the publication years, the studies cover a broad period from the early 2000s to 2019. Among the articles focusing on various topics, publications produced by health professionals, the judicial system, racial prejudice, gender stereotypes, and organizational structures stand out. Unconscious bias research has been conducted in various areas, such as health, law, psychology, and sociology. This shows that the subject is essential in many disciplines and has been examined from different perspectives. When looking at prominent themes and topics, it is understood that unconscious bias among health professionals has a significant impact on evaluating the quality of health services and patient experiences. The data showed that articles on this subject received high citations.

The effects of unconscious bias in judicial processes also play an essential role in ensuring justice. Studies in this area have focused on examining the unconscious biases of judges and legal systems. Racial biases have profound effects on social relations and equality. Studies on this subject also provide essential findings for reducing prejudice and ensuring social justice. The table data shows that various methodological approaches, such as systematic reviews, meta-analyses, experimental studies, and applied research, are used in publications on unconscious bias. This diversity is related to the reliability, robustness, and comprehensiveness of research on unconscious bias.

Studies that have received high citations have significantly impacted the academic world and practical applications. Studies conducted on this subject provide meaningful guidance for recognizing and reducing unconscious bias in health services, the legal system, education, and the workplace. The fact that articles are read by a broad audience and receive high academic citations indicates that these studies are widely accepted and used as references in various fields. In summary, the most cited articles on unconscious bias show that research in this field is handled comprehensively and in-depth and reveals significant findings with information and contributions from various disciplines. It should be noted that these studies contribute both to theoretical knowledge and help ensure social equality and justice by providing practical solutions.

Table 10 presents the data on the most cited publications based on the references of articles produced due to unconscious bias. According to these data, the article "Measuring individual differences in implicit cognition: The implicit association test" is the most cited publication, with 191 citations in WoS and 16.646 citations in Google Scholar. This study is a primary reference on the Implicit Association Test (IAT). Article "Understanding and using the implicit association test: I. The improved scoring algorithm" ranks second with 117 citations in WoS and 6.896 in Google Scholar. Article "Understanding and using the implicit association test: III. Meta-analysis of predictive validity" ranks third with 96 citations in WoS and 4.353 in Google Scholar. As mentioned, Google Scholar citation counts are generally higher than those of WoS, indicating that the articles are referenced by a more comprehensive (academic) audience. In particular, the article titled "Implicit social cognition: Attitudes, self-esteem, and stereotypes" stands out with a very high Google Scholar citation count of 10.108.

The Implicit Association Test is one of the most frequently used tools in unconscious bias research and is also a research tool. Studies conducted on this test constitute the essential reference points of the field, and the publications produced by this tool stand out because of their high citation numbers. The 1998 study by Greenwald, McGhee, and Schwartz was the most important publication that introduced the Implicit Association Test and laid the foundation for the measurement.

Publications have generally focused on various topics, such as measuring unconscious bias, cognitive processes, and the flexibility of prejudices and stereotypes. It is seen that academic publications on the subject have been published in various respected journals such as "Journal of Personality and Social Psychology", "Psychological Review", "California Law Review" and "Health Psychology". These journals represent disciplines such as psychology, law, health, and the social sciences. As previous data have shown, this data confirms once again that unconscious bias is a multidisciplinary field of research. Unconscious bias research has been conducted in various fields, such as cognitive psychology, social psychology, health, and law. This diversity shows that the subject has multifaceted and wide-ranging interests. For example, studies by Devine and Dovidio have examined automatic and controlled components of biases and made essential contributions. Other publications, such as the 2001 study by Dasgupta and Greenwald, examined practical interventions and ways to reduce biases. Researchers such as Greenwald, Banaji, and Nosek are prominent figures in the field of unconscious bias, have contributed to many highly cited publications, and have made significant contributions to the development of the field. As a result, the most cited publications on unconscious bias constitute the foundation of research in this field and

reveal significant findings and contributions from various disciplines and fields. These studies contribute to the theoretical knowledge and practical solutions that help achieve social equality and justice.

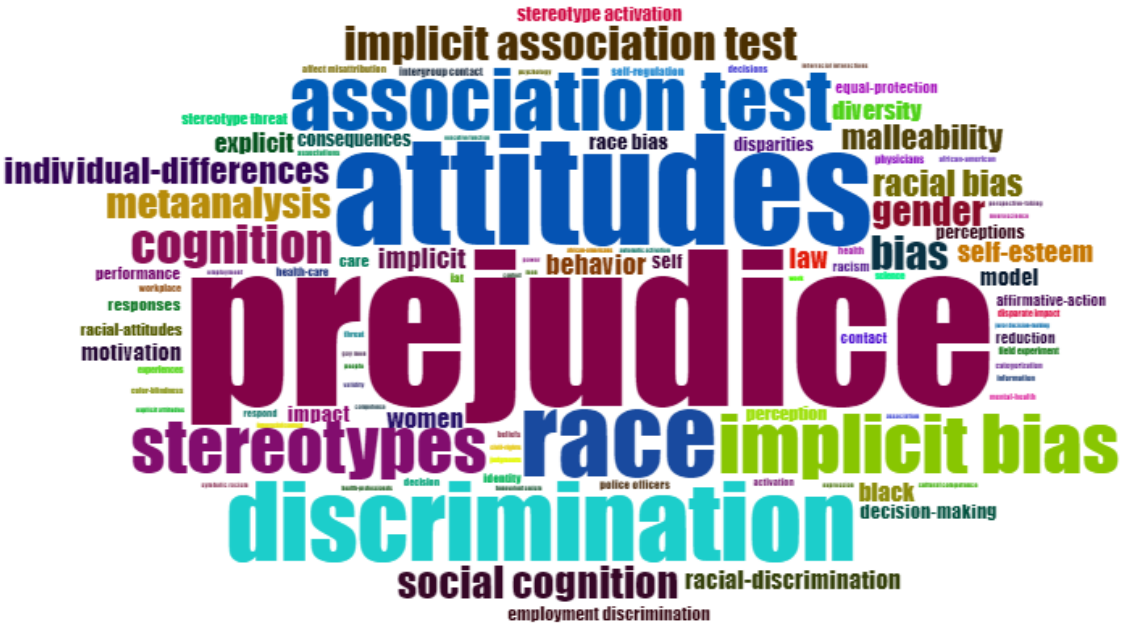


Figure 3. Keyword cloud

The word cloud shown in Figure 3 is created based on the 100 most frequently repeated words based on the "Keywords plus" of the articles examined within the scope of the research. Font size increased in parallel with the frequency of word use. In other words, the word cloud is created according to the most frequently repeated keywords. As can be seen from Figure 3, the top ten most frequently used keywords are "prejudice" (206), "attitudes" (147), "race" (107), "discrimination" (105), "association test" (83), "implicit bias" (79), "stereotypes" (73), "cognition" (52), "implicit association test" (46) and "bias" (45). Other prominent keywords are "race" and "racial bias". These words indicate that racial prejudice is an essential focus of studies on unconscious bias. Similarly, the frequency of the word "stereotypes" suggests that it is frequently discussed as part of unconscious bias. The most commonly cited publications used the Implicit Association Test. Therefore, it is not unusual for this word to be prominent in a word cloud. The frequency of the words "gender" and "gender bias" indicates that gender-related prejudice is also an essential part of studies.

The word cloud, visually presented in Figure 3, shows that unconscious bias studies cover a wide range, and many different aspects are addressed. In summary, this word cloud clearly shows how broad and multifaceted research on unconscious bias is, including many other concepts and themes. This reveals the complexity of the topic and the richness of the research area.

Figure 4 shows the trends in the topics studied by year. No time constraint was applied to determine the trend topics; however, two issues were considered in determining the topics to be included in the analysis. The number of words shown in the figure by year was determined to be 3, and topics with a minimum word frequency of 5 and above were included in the analysis. Only trend topics from 2006 to 2023 were included in the figure because of this criterion.

Figure 4 shows the various research trends (trend topics/subject titles or terms) related to unconscious bias between 2006 and 2023. The frequency of the terms is represented by circle sizes that show how frequently they are studied. When the distribution of topics by year was examined, it was found that more basic concepts and classical bias studies were conducted between 2006 and 2010. In this period, terms such as "social cognition", "stereotypes", "discrimination" and "implicit association test" are prominent. There was a tendency towards more specific topics between 2010 and 2015. Terms such as "implicit bias", "stereotype activation", "employment discrimination" and "police officers" were prominent. Various social topics and interventions have been studied between 2015 and 2020. The prominent terms in this period were "microaggressions", "meta-analysis", "racial bias" and "health". Between 2020 and 2023, the terms "diversity", "social identity" and "interventions" appear to be prominent.

When we look at the general trends revealed in Figure 4, it is seen that topics such as "Implicit bias" and "racial bias" have maintained their importance over the years and that research and publications on these topics have increased. Notably, newer topics, such as "microaggressions" and "social identity" have become popular in recent years. The recent prominence of topics such as "health" and "mental health" shows that prejudice has become an important research topic in health-related areas as well. In recent years, the increasing importance of inclusive topics such as "diversity" and "equity" shows how social awareness and policies shape the research agenda. In conclusion, the evaluations of the data in Figure 4 show how academic research on prejudice has evolved and which topics are focused on more. These trends follow a parallel course with social change and political development.

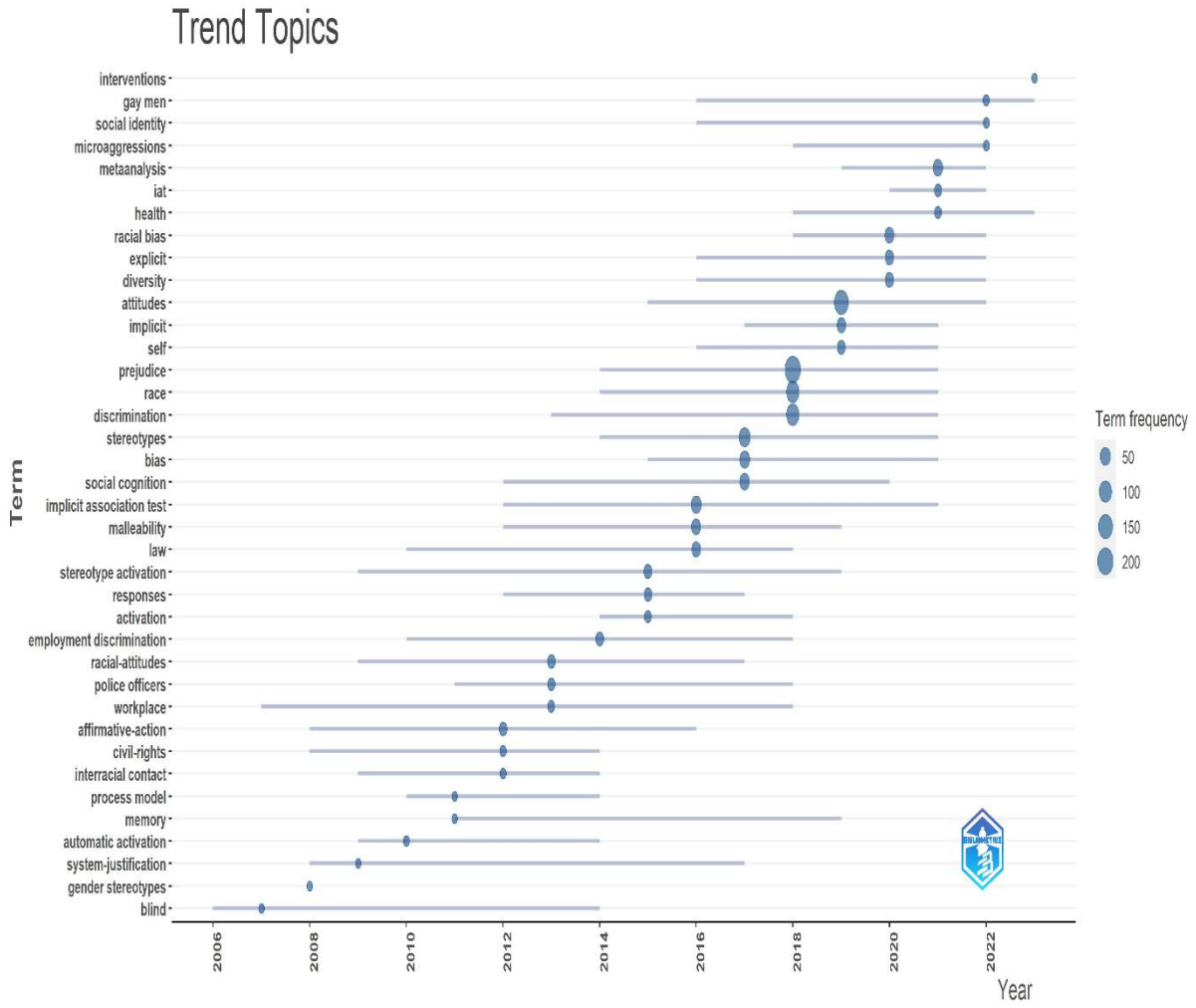


Figure 4. Trend topics by year

Within the scope of the research, a "co-occurrence network" was visualized based on the words in the "Keywords plus" fields of the examined studies. When Figure 5 is examined, two different clusters are formed. The prominent keywords in the cluster visualized in blue were prejudice (btwc=243.619), attitudes (btwc=107.896), association test (btwc=31.130), stereotypes (btwc=24.487), implicit association test (btwc=13.404), and cognition (btwc=8.478). The most common words in the other clusters visualized in red are race (btwc=68.815), discrimination (btwc=52.390), and implicit bias (btwc=37.604). Co-occurrence networks were also formed between keywords in the two clusters.

The numbers in parentheses, betweenness centrality (btwc), are an important measure of centrality in network analysis and indicate how often a given node (in this case, a keyword) appears in the shortest paths between other nodes in the network. A high betweenness centrality indicates that the node plays a crucial mediating role in the overall structure of the network. For example, a keyword with a high betweenness centrality value, such as "prejudice" (243.619), has a central position in the network and frequently appears in the links between other keywords.

This shows that the concept of prejudice plays a critical role in prejudice research and has a significant relationship with many different concepts. High betweenness centrality indicates that this concept is an essential link in many different studies and contexts, and has meaningful relationships with other concepts. In this context, we can better understand how prejudice and discrimination relate to each other and to other concepts, and which concepts play a more central role with the help of betweenness centrality values.

In the Figure 5, the two different clusters are represented in blue and red. The blue cluster is shaped by prejudice and related concepts. The red cluster is centered around race and discrimination.

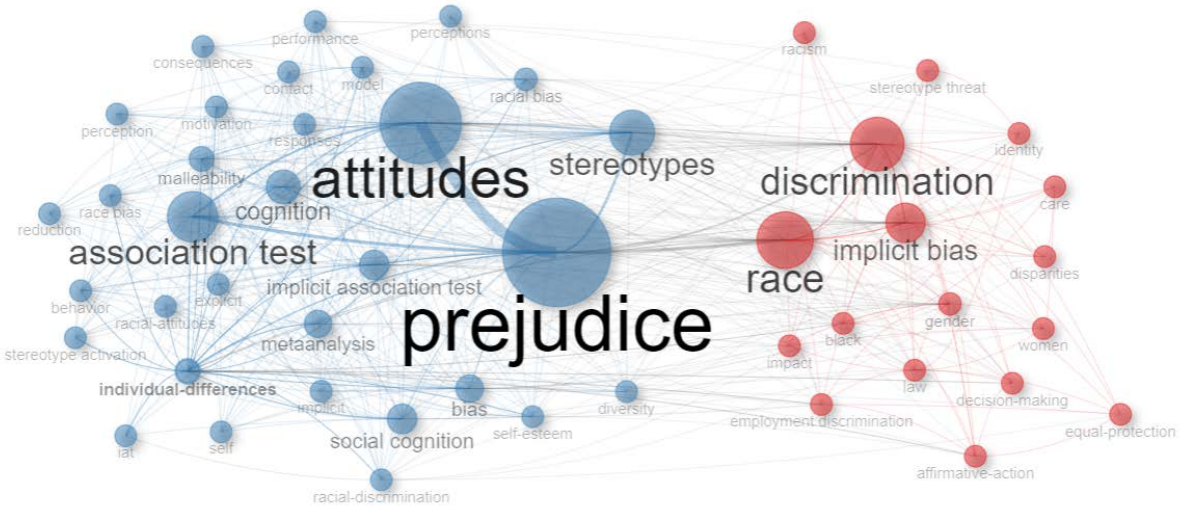


Figure 5. Co-occurrence network

Blue Cluster (Prejudice)

Prejudice (btwc=243.619). The concept of prejudice is at the center of the network and has a high betweenness centrality value. This indicates that prejudice is connected to many other concepts and plays a central role. Attitudes (btwc=107.896). The concept of attitudes is another keyword frequently studied, along with prejudice. Association Test (btwc=31.130). The association test is a common tool used to measure prejudice. Stereotypes (btwc=24.487). Stereotypes are vital components of prejudice. Implicit Association Test (btwc=13.404). Implicit Association Test is a test used to detect unconscious biases. Cognition (btwc=8.478). Cognitive processes play an important role in the formation and maintenance of prejudice.

Red Cluster (Race and Discrimination)

Race (btwc=68.815). Race is at the center of discrimination studies. Discrimination (btwc=52.390). Discrimination is studied as a concrete result of prejudice. Implicit Bias (btwc=37.604). Implicit biases work as hidden factors underlying discrimination.

Connections between Clusters

There are also strong co-occurrence networks between the two clusters. For example, there are direct connections between prejudice in the blue cluster, and discrimination in the red cluster. These connections show how prejudice and discrimination topics complement each other, and are often studied together. Consequently, concepts such as prejudice and attitudes are at the center of the network, indicating that they are related to many other concepts. This reveals that prejudice studies have a wide range of influence. The fact that topics such as race and discrimination are also at the center shows how social and individual prejudices affect discrimination. The high betweenness centrality values between keywords show the critical roles of these concepts in prejudice and discrimination studies. This network structure clearly shows how complex and multifaceted prejudice and discrimination studies are as well as how intertwined they are.

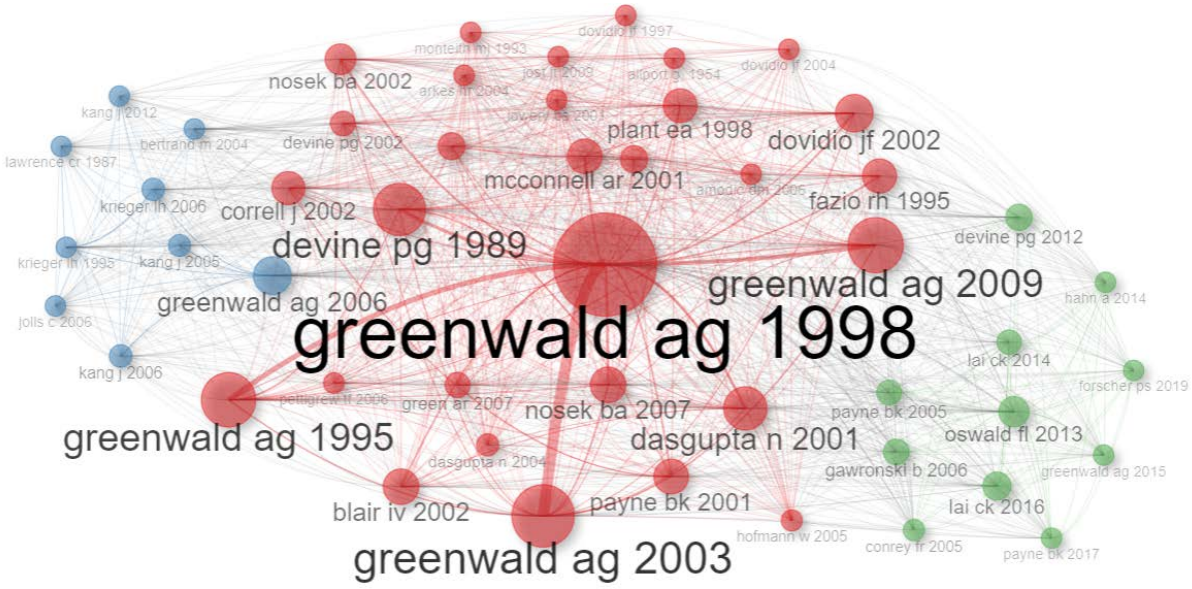


Figure 6. Co-citation network by articles

Figure 6 shows the co-citation networks used in these studies. The co-citation network map shows the surname and initials of the first author of the cited articles and the date on which the article was published. The nodes of articles on the map grew as the number of co-citations increased. Again, the thickness of the lines between the articles indicates strong connections between them (Popadic and Milohnic 2016). As shown in Fig. 6, three clusters were formed. The cluster shown in red includes articles by Greenwald (1998 [btwc=44.675]; 2003 [btwc=19.254]; 2009 [btwc=16.283]; and 1995 [btwc=14.362]), Devine (1989 [btwc=14.311]) and Dasgupta (2001 (btwc=12.365]), stands out in common citations. Again, articles by Greenwald (2006 [btwc=70.153]) and Kang (2006 [btwc=23.554]; 2005 [btwc=23.529]) lead the cluster in blue. Finally, the cluster shown in green is represented by Devine (2012 [btwc=44.438]), Gawronski (2006 [btwc=38.848]), Payne (2005 [btwc=36.391]) and Oswald (2013 [btwc=36.241]).

Figure 6 shows the network of citations among academic articles on the topic. Larger nodes represent more-cited articles, whereas smaller nodes represent less-cited articles. The node colors represent specific clusters or topics.

Greenwald AG 1998 article, which stands out as the largest node in the visual, plays a central role in the unconscious bias literature. This role shows that this article is frequently cited by many other studies and is one of the foundational studies in this field. Greenwald AG 2003 and Greenwald AG 1995 articles are also essential citation points and show how influential Greenwald is in prejudice literature. As one of the other large nodes, Devine PG 1989 article is an important reference point in prejudice research.

Clusters and Themes

Red Cluster is centered around Greenwald's articles. Greenwald's work focuses on topics such as "implicit bias" and "implicit association test". This cluster contains the primary references for many studies in this area. The Blue Cluster seems to represent studies that include prejudice and discrimination. More specific and empirical studies have also been conducted. The Green Cluster contained studies that referred to new and emerging topics. This can be considered to focus on new methodologies and applications.

Network Structure and Connections

The dense connections between the key articles indicate that these studies are frequently referenced and benefit from each other. There are powerful connections between Greenwald and Devine's works. The large number of links from large nodes indicates how these studies are used in the broader literature and how they influence other work in the field.

In summary, Greenwald and Devine's work is a cornerstone of unconscious bias research, and many studies have been conducted on these articles. The clusters reflect the evolution and diversity of research themes and methodologies. This shows how different research paths have been developed and how the field has expanded. Citation networks also show how specific studies have formed broader literature and how these studies interact

with each other. The analysis we have attempted to conduct on the data in Figure 6 helps us understand the critical articles in the unconscious bias literature, their relationships with each other, and the evolution of research themes over time.

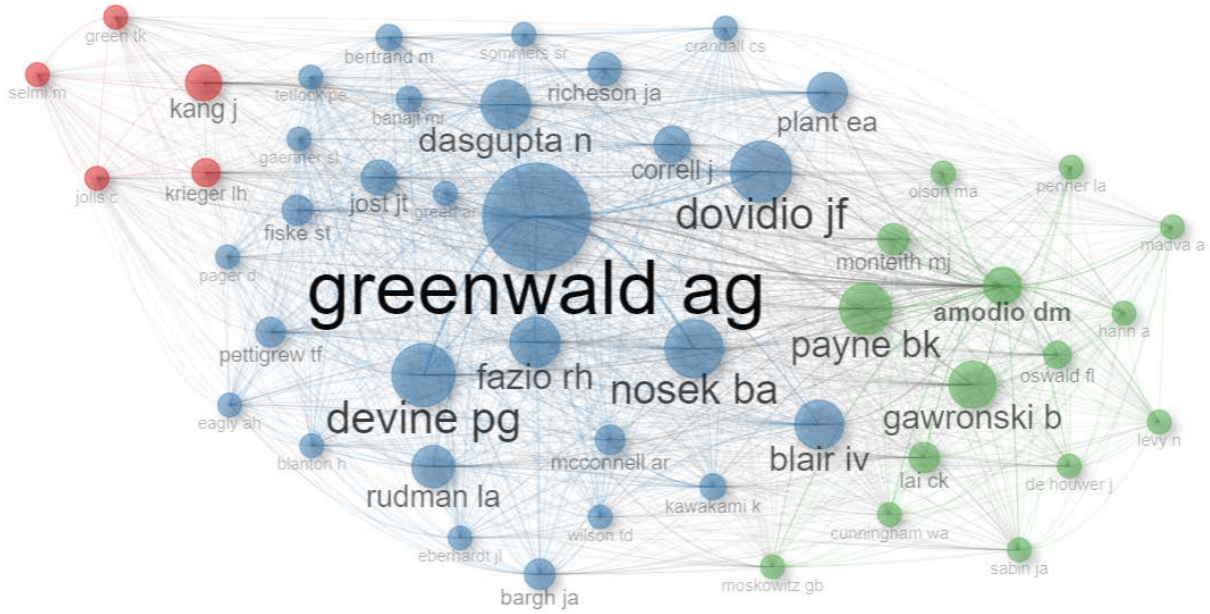


Figure 7. Co-citation network (authors)

The network map of the co-cited authors shows that three different clusters were formed. As shown in Figure 7, the blue cluster in which A.G. Greenwald (btwc=38.596) is the most crucial representative stands out as a result of the analysis. P.G. Devine (btwc=10.625), B.A. Nosek (btwc=10.361) and J.F. Dovidio (btwc=10.218) are notable within the cluster. The representative of the cluster shown in green is B.K. Payne (btwc=92.023), followed by researchers named B. Gawronski (btwc=63.400) and D.M. Amodio (btwc=47.676). In the red cluster there are researchers such as J. Kang (btwc=64.078), I.H. Krieger (btwc=29.652) and C. Jolls (btwc=11.199).

The researchers in the figure formed specific clusters, each represented by certain colors. This analysis will help us to understand how these researchers and their work are related. In this figure, researchers are shown with connections according to their papers' citations. There were three main clusters: blue, green, and red. The size of the nodes indicates the author's centrality in the network and the number of citations received.

Blue Cluster Representative: A.G. Greenwald

A.G. Greenwald (btwc=38.596) is the network's central and most crucial node. Greenwald's work is central, especially in "implicit bias" and "implicit association test". P.G. Devine (btwc=10.625). Devine is notable for his work on "prejudice" and "attitudes". B.A. Nosek (btwc=10.361). Nosek has done significant work on "implicit bias" and "social cognition". J.F. Dovidio (btwc=10.218). Dovidio is an essential figure in the areas of "discrimination" and "implicit bias".

Green Cluster-Representative: B.K. Payne

B.K. Payne (btwc=92.023). Payne is prominent with his work on "implicit bias" and "social cognition" and is central to this cluster. B. Gawronski (btwc=63.400). Gawronski has essential works in the fields of social psychology and cognitive psychology. D.M. Amodio (btwc=47.676). Amodio is working on "social cognition" and "neuroscience".

Red Cluster-Representative: J. Kang

J. Kang (btwc=64.078). Kang is notable for his work on legal prejudice and discrimination. I.H. Krieger (btwc=29.652). Krieger has essential work on social equality and justice. C. Jolls (btwc=11.199). Jolls works on prejudice in the fields of law and economics.

The Blue Cluster includes authors who focus on "implicit bias" and "implicit association test" and investigate the cognitive aspects of prejudice. A.G. Greenwald stands out as the most crucial figure in this cluster. The Green Cluster includes authors on "social cognition" and "neuroscience". Authors such as B.K. Payne, B. Gawronski,

and D.M. Amodio are prominent names in this cluster. This cluster examines social cognitive processes and the neuroscientific basis of prejudice. The Red Cluster includes authors who work on legal prejudice and social equality. J. Kang, I.H. Krieger, and C. Jolls are the most influential figures in this cluster. This cluster focuses on the legal and social consequences of prejudice.

In conclusion, this network map shows which authors play a central role in prejudice research and the topics on which they focus. The connections between the clusters show how studies in these areas interact, and how different research topics intersect. Each cluster represents a specific research theme and methodology. This reveals how prejudice research is addressed across a broad spectrum, and how various disciplines contribute to it. Our analysis of the data in Figure 7 allows us to understand which authors and studies play a central role in research on prejudice and discrimination, and how these studies are related.

The collaboration map of the authors of the articles included in the research is given in Figure 8. According to the map formed as a result of the analysis, eleven different clusters were formed. The researcher with the most effective and powerful collaboration was J.F. Dovidio (btwc=376.800) in the cluster shown in green. N. Ellemers (btwc=204.000), J. Calanchini (btwc=135.000), J. Kang (btwc=112.000) and N. Dasgupta (btwc=60.000), who are in different clusters, are also among the researchers with essential collaborations and they also collaborate with researchers in other clusters.

In the Figure 8, the collaboration network is organized into eleven different clusters. The clusters are shown in various colors. The green cluster, where J.F. Dovidio is located, stands out as the most effective and powerful collaboration cluster. J.F. Dovidio's btwnc value is 376.800, which shows his central role in the network and importance in collaboration. Dovidio is at the center of the network and has the most vigorous collaboration. N. Ellemers in the light blue cluster stand out as a vital collaboration figure with a btwnc value of 204.000. Calanchini, in the brown cluster, stands out with a btwnc value of 135.000. Kang is in the blue cluster and is among the critical collaboration structures with a btwnc value of 112.000. Dasgupta is also in the blue cluster and has a vital collaboration role, with a btwnc value of 60.000.

The Figure 8 shows researchers' central positions and connections with other researchers. Researchers such as N. Ellemers, J. Calanchini, J. Kang, and N. Dasgupta developed collaborative relationships outside of their clusters. This indicates that they have a wide network of interactions in the field. The central role of J.F. Dovidio reveals his influence in the field and his strategic position in the collaboration network. It can be said that this researcher's work and collaborations shape other research in the field. Researchers located in different clusters in the network and collaborating show that research in the field is diverse, interdisciplinary, and multifaceted. This situation points to the richness of studies on unconscious bias and integration of different perspectives. This collaboration network shows that there are new collaboration opportunities for less connected or isolated researchers in addition to existing strong collaborations. This situation can be evaluated to fill the knowledge gaps in the field and open new research avenues.

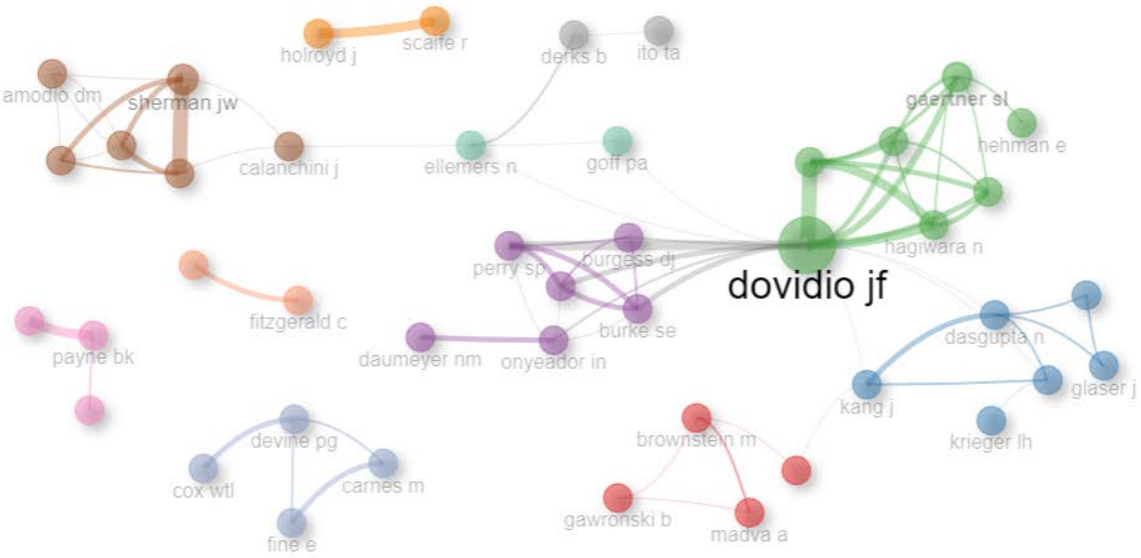


Figure 8. Collaboration network by authors

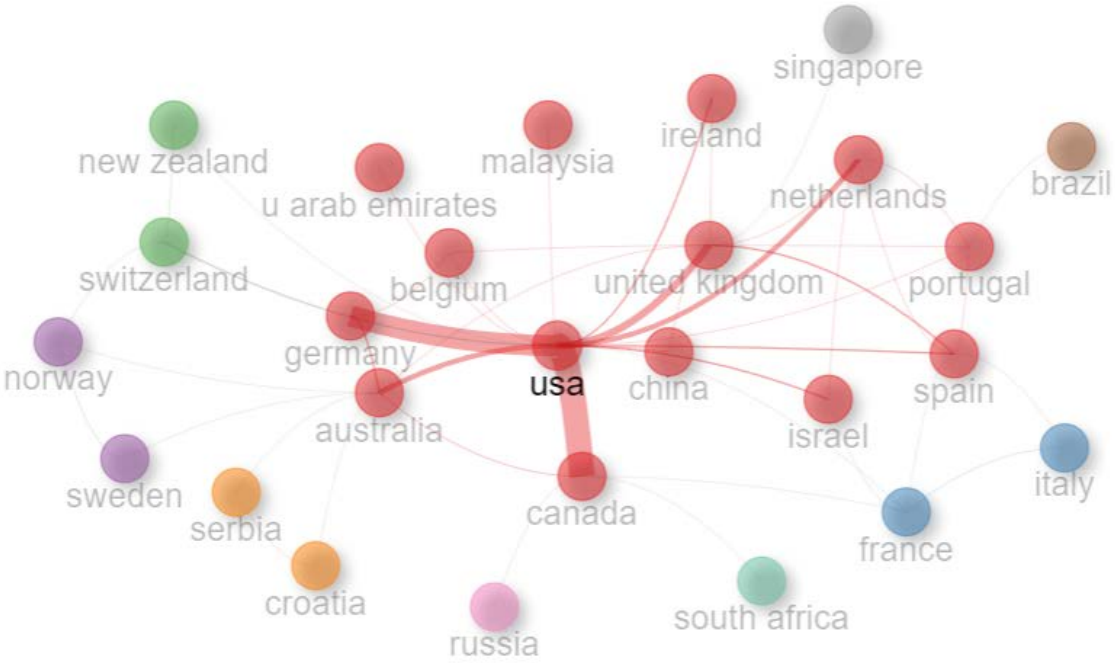


Figure 9. Collaboration network by country

When the country cooperation network is examined, nine different clusters are formed, and the countries in the cluster shown in red show strong cooperation. This cluster is represented by the USA (btwc=197.462), followed by Australia (btwc=80.805), Canada (btwc=48.716), and the UK (btwc=35.510). France (btwc=7.682) and Switzerland (btwc=5.619) stand out for cooperation.

The Figure 9 demonstrates the central role of the US, its influence in the field, and its strategic position in the collaboration network. The research collaborations in this country also guide the work of other countries. The figure shows that collaboration between countries occurs in a wide range of regions. The strong collaboration structure of the red cluster also interacts with other clusters, enabling sharing of information and resources. This collaboration network shows that there are new collaboration opportunities for less connected or isolated countries in addition to the existing strong collaborations. Countries such as France and Switzerland appear to have the potential to collaborate more in the research field by forming wider networks..

Discussion

We believe that future studies should fill the gaps in knowledge regarding unconscious bias and contribute to social change by increasing awareness in this area. Unconscious biases are hidden dynamics that deeply affect individuals' decision-making processes and social relationships. Therefore, a more comprehensive understanding of these biases with contributions from different disciplines should constitute an influential research agenda, not only in the social sciences but also in areas such as neuroscience, software related to decision-making processes, technical and technological disciplines related to algorithms, and engineering. Strategies, educational programs, and policy recommendations to reduce the adverse effects of unconscious biases at societal and institutional levels can contribute to building a more inclusive and just society. In this context, qualitative and quantitative research is critical in recognizing unconscious biases and developing conscious resistance to these biases.

In this context, it can be said that there are some gaps in the existing literature and various opportunities for future research. For example, research on unconscious bias is mainly conducted in the USA and Western countries. Examining how unconscious biases emerge in other cultural and geographical regions and their social effects can fill an essential gap in literature. Studies conducted in the Middle East, Asia, Africa, and Latin America, in particular, will provide a global perspective on this field. Specifically, it should be said that studies on unconscious/implicit bias in the context of Turkey are extremely limited. In Turkish society and culture, there are severe deficiencies in the academic field regarding noticing, recognizing, understanding, and overcoming unconscious bias. A simple search of the National Thesis Center of the Council of Higher Education (YÖK) using the keywords "unconscious bias" or "implicit bias" shows that there are no master's or doctoral studies on these

topics as of December 2021 (Suveren 2022). The only exception is a doctoral thesis proposing the adaptation of the Implicit Association Test (IAT) to Turkish culture (Şenyurt 2018). In addition, there is an article published in 2020 by the authors of this thesis (Şenyurt et al. 2020). A similar situation is seen in the search conducted on the DergiPark platform, in addition to the study by Korkmaz (2017) (Suveren 2022). However, this situation may offer important opportunities for academics, particularly young researchers. Primarily, new studies on unconscious biases can contribute to the academic literature by filling important gaps in knowledge in this field. In addition, research on this subject can produce original data and findings on Turkish society and culture, attracting international attention and contributing to the field. Researchers can advance their academic careers and provide social benefits by developing projects to eliminate deficiencies in unconscious bias, especially for young researchers. Studies in this field offer the opportunity to develop new methodologies, create local measurement tools, and make cultural adaptations, thereby allowing researchers to adopt innovative approaches. In addition, an interest in this topic can enable researchers to receive support from various national and international sources.

It can be said that more studies should be conducted to examine how unconscious biases emerge in different institutional and political contexts, such as workplaces, educational institutions, health services, and the justice system, as well as the effectiveness of strategies to reduce these biases. Studies evaluating the effects of policies and practices implemented in institutions on unconscious bias will contribute to developing more inclusive and fair practices.

We believe that there is also a need for cross-disciplinary studies examining the interactions of unconscious biases across disciplines. For example, investigating how unconscious biases intersect in psychology, sociology, law, education, and health, as well as the wide-ranging effects of these biases on individuals and societies, can enrich the literature and guide practice.

We want to touch upon two topics that should be emphasized independently from the research data. The first is related to the functioning of unconscious biases at the individual level, whereas the second is related to technical and technological developments. More research is needed to examine how unconscious biases vary at the individual level and which factors (e.g., personality traits, social environment, and education level) influence these biases. Understanding the impact of individual differences on unconscious bias may allow for the development of more targeted intervention programs (Skinner-Dorkenoo et al. 2023). The second topic concerns the relationship between technical and technological developments, and unconscious biases. It is also necessary to emphasize that studies should examine how unconscious biases are shaped in the digital age, and how social media, artificial intelligence, and other technological tools and digital platforms affect these biases. In particular, research on how algorithms and artificial intelligence systems reflect or reinforce unconscious biases can help develop strategies for more ethical and fair use of these technologies (Elsbach and Stigliani 2019, Johnson 2020, Lopez 2021).

In our opinion, these suggestions offer important areas for expanding and deepening unconscious bias research. Future studies may fill these knowledge gaps, contributing to a better understanding of unconscious bias and developing effective strategies to reduce it.

Finally, we address the limitations of this study. First, since the research was based only on the Web of Science (WoS) database, the study did not include potential articles in other databases. The exclusion of studies from different sources, such as Scopus, PubMed, and Google Scholar, from this analysis may mean that not all trends in the literature are reflected. This may limit the generalizability of our results. Second, only articles written in English were included in this analysis. This may have excluded potentially important studies in other languages and increased the risk of ignoring the findings in specific cultural contexts. Third, as stated in the exclusion criteria, fields such as natural sciences, engineering, and health sciences were excluded from the scope of the study. This exclusion may have limited access to studies examining the effects of unconscious bias in these fields and may have resulted in the lack of a multidisciplinary perspective. Fourth, the articles included in the analysis covered the period until the end of 2023. This study is beyond the scope of publication in 2024. Therefore, the most recent studies on unconscious bias were excluded from the analysis and the trends examined in this study may not fully reflect more recent work or new theories or approaches. Finally, since bibliometric analysis focuses only on the quantitative aspects of studies, there is always the possibility that in-depth conceptual analyses and contextual factors will be overlooked. This limits a more holistic assessment of theoretical and methodological contributions to the field. In addition, using only bibliometric analysis in the study may have limited the possibility of comparing or supporting the results obtained using different methodological approaches (qualitative or mixed).

Conclusion

The data of this study show that research on unconscious bias has increased significantly over the years, and that scientific interest in this area is also increasing. The significant number of publications, especially since 2012, indicates that awareness of and interest in unconscious bias have increased in academic circles and society. This increase shows that unconscious bias has become an important research topic in traditional fields, such as psychology and social sciences, and in different disciplines, such as law, health, and education. The increasing number of publications, especially in recent years, reveals that unconscious bias has become more important than just an academic issue but also a social issue. This situation can be considered a reflection of diversity and inclusiveness initiatives in the education and workplace. The interdisciplinary nature of research on unconscious bias emphasizes the complexity of the subject and the importance of addressing it from various perspectives. These studies are of great importance in understanding the effects of unconscious bias on social equality and justice and in developing strategies to reduce these biases.

The data from this study show that journals and authors that publish the most on unconscious bias make leading contributions to this field. Journals such as the "Journal of Experimental Social Psychology", "Personality and Social Psychology Bulletin" and "California Law Review" stand out in terms of both the number of publications and citations. The high citation numbers of articles published in these journals show that these studies are widely accepted in academic circles and have a significant impact. Names such as John Francis Dovidio, Nilanjana Dasgupta, and Payne B. Keith stand out among the most productive researchers. These researchers play an essential role in this field owing to their high h-index and g-index values. In addition, the fact that studies in health, law, and social psychology stand out among the most cited articles confirms that unconscious bias is a multidisciplinary field of research.

When the geographical distribution of research on unconscious bias is examined, it is observed that the USA is the leader in this field. In addition to the USA, countries such as the United Kingdom, Canada, Australia, and Germany have also made significant contributions. When looking at cooperation rates, it is seen that countries such as Australia, Ireland, and France have high cooperation rates, which contribute to an increase in the quality and diversity of research.

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